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"RAPID TARGETING TRIAD" AGAINST THE MOBILE THREAT: AN EVOLUTIONARY CONCEPT

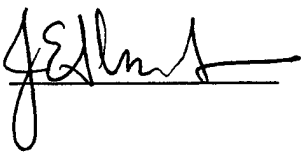
by

Julienne E. Almonte
LCDR, USN

Seminar 5

A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

Signature: 

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EXECUTIVE SUMMARY

Mobile targets are the manifestation of the asymmetric threat on the battlefield. The method to counter the mobile threat is through a dynamic/rapid targeting process and all weather precision strike capability. The objective of ***rapid targeting*** is to get inside the adversary's decision timeline to attack his mobile equipment before it moves. The rapid targeting cycle of reconnaissance, collection, target and kill is especially challenging in adverse weather. As evidenced in recent U.S. military operations and what the Joint Force Commander (JFC) may be faced with in the 21st century, the biggest challenge is rapidly targeting and engaging mobile threats effectively. The complicated, flexible, and intense nature of striking highly mobile targets within lethal mobile threat envelopes in a joint and combined environment represents the JFC's challenge. The demands and expectations by operational commanders to effectively target mobile threats in order to employ a weapon of choice will continue to increase, specifically regarding timeliness, reducing time from target identification to target destruction from *hours* to *minutes*. The workable concepts and technical means to effectively engage moving targets has been an *evolutionary* process with the emergence of the precision weapon. During Operation Allied Force / JTF Noble Anvil in Kosovo, a successful innovation came in rapid targeting. Lessons learned specific to effective rapid targeting and attack of mobile threats need to be applied to the potential theater ballistic missile threat.

A multifaceted approach to overcoming the asymmetric peril posed by mobile threats is enabled by the synergistic effect achieved by the "rapid targeting triad": ISR, C2, and weapons. The key to effectiveness in attacking mobile threats is an integrated and synchronized "rapid targeting triad" cell. This Joint Flexible Targeting Cell improves a JFC's "speed of command" to employ operational art - to employ military forces to attain strategic and/or operational objectives. If the problem of effectively engaging mobile threats is insoluble, what does the JFC need in the absence of this solution? A "risk analysis" list of guidelines is provided on what the JFC needs to consider to mitigate the risk of attacking potential future mobile targets.

Introduction

Over the next two decades, adversaries of the United States will be more likely to engage in asymmetric warfare whereby they use unconventional approaches to circumvent or undermine our strengths while exploiting our vulnerabilities. The technologies that will be employed in these actions range from obsolete to state-of-the-art, and will attempt to defeat a stronger opponent on a political and/or social level without resorting to an unequal, force-on-force battle. For example, ballistic missiles - both obsolete and advanced terminally guided systems – whether armed with high-explosive, submunition, chemical, biological, or nuclear warheads ... are types of technology that could be employed against the United States in an asymmetric manner through and beyond 2020.

... In many cases, asymmetric warfare will express itself in the form of tactical battlefield measures taken by a foreign country or stateless organization to win a limited set of political objectives during a confrontation with the United States.[1]

Mobile targets are the manifestation of this asymmetric threat on the battlefield. To mitigate the threat, success in achieving Joint Vision 2010's operational goals of dominant maneuver, precision strike, full-dimensional protection, and focused logistics depends upon **targeting** as a starting point. "Targeting is the process through which objectives are selected for **attack**, desired effects goals are determined and means are selected."[2] An effective joint targeting process is essential for the JFC and components to plan and execute operations. The joint targeting cycle of reconnaissance, collection, target and kill must be accomplished in all weather conditions. The objective of ***rapid targeting*** is to get inside the adversary's decision timeline to attack his mobile equipment before it moves.

As evidenced in recent U.S. military operations and what the Joint Force Commander (JFC) may be faced with in the 21st century, the biggest challenge is rapidly targeting and engaging mobile threats effectively. The complicated, flexible, and intense nature of striking highly mobile targets within lethal mobile threat envelopes in a joint and combined environment represents the JFC's challenge. Current timeline requirements for the simultaneous fusion of real-time/near-real-time collection with other time-late reporting and analysis, resulting in precision targeting quality products for immediate use, stretches the bounds of current operational intelligence capability to support the JFC. In this environment of Network Centric Warfare and advancing technology trends, the demands and expectations by operational commanders on the intelligence system to

effectively target mobile threats in order to employ a weapon of choice will continue to increase, specifically regarding timeliness. "Ultimately, our goal is to reduce the time from target identification to target destruction from *hours* and days to *minutes*."[3] The workable concepts and technical means to effectively engage moving targets, the fastest growing target set ashore or afloat, has been an *evolutionary* process with the emergence of the precision weapon. During Operation Allied Force (OAF) / JTF Noble Anvil in Kosovo, "our most successful innovation came in rapid targeting."[4] Lessons learned from OAF specific to effective rapid targeting and attack of mobile threats need to be applied to the potential theater ballistic missile threat.

A multifaceted approach to overcoming the asymmetric peril posed by mobile threats is enabled by rapidly linking critical mobile target information to a responsive command and control mechanism and a variety of precision engagement means.[5] Simply stated, effective attack operations against mobile targets depend on the synergistic effect achieved by the key elements of the "rapid targeting triad": ISR, C2, and weapons.[6] The key to effectiveness in attacking mobile threats is an integrated and synchronized "rapid targeting triad" cell. This Joint Flexible Targeting Cell needs to be established early on in a conflict. The cell improves a JFC's "speed of command" to employ operational art - to employ military forces to attain strategic and/or operational objectives. If the problem of effectively engaging mobile threats is insoluble, what does the JFC need in the absence of this solution? A "risk analysis" list of guidelines is provided on what the JFC needs to consider to mitigate the risk of attacking future mobile targets.

Background

> *Time sensitive targets (TSTs) are those targets requiring an immediate response because they pose (or will soon pose) a clear and present danger to friendly forces or are highly lucrative, fleeting targets of opportunity. However, the defining element of a TST is that the JFC/component commander has designated it as requiring immediate response. TSTs pose, or will pose an imminent threat to friendly forces or present an exceptional operational or tactical opportunity. TSTs can be either planned or immediate, requiring rapid response by the joint force.*[7]

The characteristics associated with mobile threats are combined with the operational factors of space and time: anything that is not fixed, implying substantial

mobility. This threat is very difficult to attack due to the transient nature of target location. There are time constraints involved in engaging mobile threats and the objective is to get inside the adversary's decision timeline to target and destroy his mobile equipment before it moves. The adversary will likely be highly adept at moving his equipment because his mobility is a key to his survival. Operational commanders are concerned with sea, air and land mobile threats including patrol craft, cigarette boats, large ground force movements, armor, temporary staging areas, tanks, heavy weapons and the range of tactical surface-to-air-missiles (SAMs, AAA, mobile radars, mobile C2), and theater missiles (ballistic and cruise missiles). The most lethal mobile threat is the theater ballistic missile, which will continue to pose a serious threat to U.S. forces. "Today's JFC must be aware of both the political and military impact of these widely proliferated weapons, and provide both the assets and the operational focus necessary to eradicate this threat from the battlespace."[8]

Operation Allied Force (OAF) was NATO's military response to the Kosovo crisis in 1999. General Clark, Supreme Allied Commander, Europe (SACEUR), stated that, "NATO operated on two axes, a strategic axis and a tactical axis ... in Kosovo, the air campaign kept the VJ (Yugoslav Army)/MUP (Special Police) running for cover. When they came out, we were able to strike them."[9] The NATO campaign focused on destroying, isolating and interdicting the VJ/MUP, and preventing a continuation of their aggression.[10] General Clark designated Yugoslav's President Milosevic's fielded forces as the primary objective requiring immediate response and the commander's intent was clear: "General Clark told us, 'guys, I want you to direct your efforts towards fielded stuff' and I will tell you that mobile targets are a lot harder than fixed targets."[11] Mobile targets included in the array of "strategic target sets" were the forces outside Kosovo with the ability to reinforce or support forces in Kosovo, the integrated air defense systems (IADs), and command and control (C2) nodes.[12]

During 78 days of OAF, SAMs posed the main credible threat to NATO forces. This threat existed for the entire duration of the conflict as Yugoslav IADS were suppressed but not destroyed. Yugoslav SAM operators fired over 700 radar guided SA-3 and SA-6 missiles at allied airmen and the preliminary assessment is that NATO forces damaged or destroyed 40 percent of the sites.[13] An additional threat was their highly

lethal, low-altitude manpad and AAA capability, forcing NATO forces to operate in a high altitude environment for sanctuary. Seventy percent of the time there was fifty percent cloud cover (21 of the 78 days had favorable weather), complicating the targeting efforts and enabling the adversary to move equipment and forces on the ground.[14] The difficulty in striking these missile sites was magnified by two Yugoslav actions: they frequently moved their missile batteries to defeat attempts to bomb them and they kept their tracking radars dormant and activated them only briefly when NATO aircraft were nearby.[15] The principle challenge of the targeting process against this threat was the timely detection, identification and targeting of air defense and fielded ground forces (armor, artillery, and troops) which made maximum use of mobility, camouflage, cover, deception and even human shields, to avoid destruction and survive to fight.

> Because there had been an early declaration that ground forces would not be used, fielded forces in Kosovo were free from the normal preparation activity we had seen in Desert Storm. Instead of preparing for a potential ground attack by digging into defensive positions and stockpiling supplies, activities that provide lucrative targets for airpower, enemy ground forces were free to simply hide from our airplanes.[16]

Technological advances, improvisions and innovative processes in rapid targeting were implemented to attack these elusive targets after identification. As a result, General Clark's operational level objectives were achieved. The effectiveness of engaging these mobile targets was one of the main contributors to end the conflict. Although major advances were made in rapid targeting, it is an evolutionary concept and development and refinement of technology, tactics, organization/doctrine and processes must continue to counter potential future mobile threats such as the theater ballistic missile. OAF demonstrated the value of technology and provided innovative tactics and processes in implementation of the "rapid targeting triad" (ISR, C2, and weapons) that can be used as a "boiler plate example" of how to rapidly target the mobile threat.

Understanding Sensor-to-Shooter Link in the Rapid Targeting Process.

Seeking precision through accurate aim remains an important aspect of military power projection and this precision is predicated on precise targeting. The targeting

process is the cycle to identify, detect (locate), track, and target the threat. While the primary responsibility for targeting resides with the JFC, the process occurs at all levels of command within a joint force by operations and intelligence personnel to ensure the effective accomplishments of theater campaign objectives.[17] Joint targeting is not a static, inflexible process, but rather a dynamic process that must be *fluidly* applied in planning, collection, and execution especially with the mobile threat. Each phase of the targeting process can directly affect other phases of the process which includes six basic phases/functions:

(1) Objectives and Guidance,
(2) Target Development,
(3) Weaponeering,
(4) Force Application,
(5) Execution Planning/Force Execution and
(6) Combat Assessment.[18]

The method to counter the mobile threat is through a dynamic/rapid targeting process and all weather precision strike capability. The objective of rapid targeting is to provide targeting quality intelligence within the enemy's movement cycle, to get inside the adversary's command decision timeline (i.e. OODA loop) to target and attack his mobile equipment before it moves. The JFC's decision cycle must be shortened in order to thwart the adversary's decision cycle. The JFC's "speed of command" is enabled and enhanced by the "rapid targeting triad": ISR, C2, and weapons.

Although the capabilities of the "rapid targeting triad" have grown by an order of magnitude since Operation Desert Storm, OAF experienced limits on ISR assets, the time taken for data dissemination and doctrinal processes, impacting the sensor-to-shooter timeline and highlighting some significant challenges. During OAF, the Combined Air Operations Center (CAOC) in Vicenza, Italy stood up an ad hoc Flexible Targeting Cell (FTC) to facilitate strikes against mobile targets. Geographically dispersed supporting commanders (for example, the Army's TF Hawk and the Navy's on-station carrier USS Theodore Roosevelt) also stood up flexible targeting cells.[19] The JFC apportioned forces and strike platforms were allocated by the Combined Forces Air Component Commander (CFACC) in the Air Tasking Order (ATO) (or retasked from CAP and other missions) to

conduct Kosovo Engagement Zone Operations (KEZ ops), specifically against mobile targets.

ISR

> *ISR resources, both equipment and personnel are essential to every aspect of modern warfare...we currently do not have enough of these assets to meet our needs.*[20]

Effective employment of operational fires has always required an ability to identify and locate the targets. From special operations forces' (SOF) "eyes on target", to pilots' eyes, to airborne electromagnetic sensors, to space-based satellite reconnaissance systems, putting bombs on target to achieve tactical, operational or strategic effects relies on the process of converting sensed data into timely, accurate, relevant and actionable information – information that is necessary for planning and executing combat operations.[21] After the JFC's objectives and goals are stated, Intelligence Preparation of the Battlespace (IPB) is the beginning of the target development phase, using Intelligence, Surveillance, and Reconnaissance (ISR) assets, managing the sensors, detecting and identifying, data collecting and processing, classifying, and disseminating. OAF's wide array of U.S. surveillance and reconnaissance sensors which provided critical near-real-time information included space based systems (Defense Support Program - DSP) and aerial systems (tactical UAV's – Pioneer/Predator/Hunter, Joint Surveillance Target Attack Radar System (JSTARS), AWACS, EP-3, specially configured P-3, RC-135, U-2, EA-6B, E-2, F-14 TARPS, F-14 LANTIRN, FA-18 FLIR). Challenges highlighted in the CAOC's FTC were an effective integration and synchronization of all these National/Theater/JTF collection systems and delineation of ISR assets' OPCON/TACON to subordinate units. To overcome these challenges, "CAOC generated a combined force ISR battle management plan that mirrored the air tasking order with supporting ISR sorties and activities."[22] OAF's ISR assets identified "pop up" targets of opportunity and:

> then transmitted the data for analysis to the CAOC's FTC and to stateside locations. Planners translated and processed the data into targeting information, relaying the target to strike assets for destruction. The process was continuously refined until we could process targeting information between our sensors and strike aircraft in a matter of hours.[23]

OAF's profusion of advanced sensor and intelligence gathering and exploiting platforms offered a means to overcome the challenge of rapidly identifying and locating targets in the battlespace before they moved.

> For the first time, Predator Unmanned Aerial Vehicle (UAV) was used in a targeting role in OAF. Before Allied Force, the Predator could transmit targeting imagery to its operator on the ground as part of the intelligence collection network. During OAF Predator video was reviewed in real-time and immediately provided pilots with the location of mobile Serb targets. Toward the end of OAF, the Predator was equipped with a laser so that it could place a beam on a target -this identified it so a loitering strike aircraft could destroy it. Predator with laser was successfully employed only once before Allied Force ended.[24]

This capability represents future potential for rapid targeting. Theater air breather assets such as the U-2 provided near-real-time imagery to the CAOC's FTC, allowing analysts to subsequently identify potential Global Positioning System (GPS) targets.[25] Precise coordinates and timely targeting were required. OAF capitalized on the flexible employment and cross-cueing of high demand/low density ISR assets (JSTARs, AWACS, EP-3, specially configured P-3, and RC-135). CAOC's FTC effectively used tactical collections assets, for example the sensor-to-shooter timeline was achieved in an 8-hour timeline using the F-14 TARPS.[26] While TARPS achieved tactical collection success, *all weather* collection capability is needed at the tactical level.

DATA DISSEMINATION

> *You have sensors and shooters, along with how that info gets to the shooter. Basically, that is the name of the game. The sensor must have the capability to PID (positively identify) the target and pass on the relevant info to whoever is shooting. Currently we have both sensors and shooter capabilities, but getting info to the shooter has been cumbersome.*[27]

Once the data and information is obtained, it must be processed into actionable intelligence before providing it to the shooter. Timely, relevant and accurate information (ELINT, IMINT, SIGINT, HUMINT, MASINT) must be fused together into actionable intelligence and disseminated to the shooter for attack expeditiously. What drives the significance of timely intelligence processing in a rapid targeting environment are combat circumstances necessitating the short fuse tasking of the weapon system to be employed.

The nature of mobile targets provides an *extremely limited window of vulnerability or opportunity to conduct an attack.*

To overcome this challenge, Real Time Information In the Cockpit (RTIC) -- direct "TV" (targeting information and real time information) to the cockpit -- was primarily designed for aircraft going after mobile targets that aircrews operating on alert have not had the opportunity to pre-plan. RTIC is well beyond the technology used during the SCUD hunts of Desert Storm. RTIC became operational in Bosnia by September 1996 but proved its success as a key enabler to dynamic battlespace management during OAF. For the first time in combat, RTIC-type systems enabled B-52's and B-1's to get the latest intelligence overlaid with digital products, maps and some imagery.[28] Multiple Source Tactical System (MSTS) was a near-real-time flex targeting prototype capability that provided real-time intelligence in the B-1 cockpit.[29] Lieutenant General Short, NATO's Air Component Commander during OAF, fully supports this capability,

> I think it's across-the-service position that we need everything we can get our hands on to move data to the cockpit as rapidly as possible ... one of the great success stories in addition to the B-2 is the F-15E/AGM-130 combination, where we were able to get U-2 imagery, and then mensurated coordinates produced by an intelligence squadron, send that imagery and those coordinates to an F-15E crew which was orbiting off the coast of Kosovo, and send them in to attack a radar that we had found just before ... we have upgraded a system that allows us to move information between airplanes. We need to be able to do that across the fleet, to move information to A-10's and F-16's and F/A-18's and F-14's, everything we have got, to allow the kids to rapidly respond to the emerging situation. Clearly one of the great challenges of Kosovo was, because there was not an army in the field and because there were IDPs throughout the area of operation, we had to put eyes on target every time we were going to strike a tank or an artillery piece or whatever. So getting information to the cockpit was half the battle; getting eyes on target was the second half.[30]

While rapid targeting worked, the process was not perfect. "Aircrews faced a confusing barrage of verbal targeting instructions in the cockpit."[31] Not all aircraft were capable of displaying target imagery or of receiving target coordinates digitally while in flight.

The "long pole in the tent" frequently was timely receipt, analysis, and dissemination of national imagery. Adverse weather had a negative impact on

surveillance, target geo-location and engagement (EO/IR seekers and designators). Current intelligence architecture still lagged the mobile target problem. Potential fixes for the future include better integration of assets, means to bypass chokepoints in imagery analysis/interpretation process, means to pass intelligence in parallel to lower echelons rather than in sequence (i.e. time sensitive imagery to all the players simultaneously). OAF highlighted that collection cycles need to marry up with aircrew vulnerability times in order to more efficiently prosecute targets. Melding the operational and collection plans prior to execution is particularly important. The collection planning is the basis for all decisions covering the allocation of ISR resources in both the planning and dynamic retasking processes.

C2

> *From the earliest times through World War I, battles and wars were directed against people. The focus of effort was on killing enemy forces until the opposition withdrew or surrendered. Beginning with World War II and continuing through the Persian Gulf War, the main goal of battle made a transition from destroying people to destroying war machines. Tanks, airplanes, artillery, armored personnel carriers, air defense weapons and surface-to-surface missiles have been the prime objectives against which firepower is planned and directed. Now, however, there is a new era emerging - information. Information is the key to successful military operations; strategically, operationally, tactically and technically. From war to operations other than war, the adversary who wins the information war prevails.*[32]

> CAOC's FTC
>
> operated a first-ever distributed ISR architecture, providing actionable information to the decision makers. Employing distributed operations, targeting and intelligence support was accomplished between units located at Beale (CA), Omaha (NE), Washington, Ramstein, HQ SHAPE, and several other sites located overseas and CONUS supporting real-time operations. To successfully support the expeditionary nature of our forces, we must continue to invest in systems and the architecture to support these type of distributed real-time operations.[33]

The high-endurance and real-time information capabilities of OAF's ISR platforms provided the commander with greater situational awareness (SA)/dominant battlespace awareness, facilitating the commander's decision process. The joint and combined C2 aspect of the "rapid targeting triad" emphasized centralized control and decentralized execution.

CAOC's FTC's C2 was tailored to assess the JFC's target priorities, rapidly identify threats, control ISR, fuse the collected data, optimize weapon-target pairing and recommend the most suitable platform for engagement against the desired mean point of impact (DMPI). Optimum conditions for successful attack operations included expeditious information flow and real-time decisions, achieved through C2 systems and dynamic battlespace management. Controlling and directing the myriad of ISR assets coupled with weaponeering was essential to "managing" OAF's battlespace challenges. Real-time decisions had to be made for force application and subsequent decentralized execution.

CAOC's FTC refined processes of expeditious information dissemination to other subordinate commands by on-line collaboration, cross-coordination and "in-parallel" information flow, resulting in timely actionable intelligence to the shooter. A common understanding of timely and accurate targeting and threat intelligence and shared situational awareness was eventually achieved with on-line databases of combat assessment, BDA, master target file numbers, on-line collaborative tools, products, and systems. However, a shortfall in OAF's C2 network was a common operational picture throughout the battlespace.

Weaponeering

> *If one component cannot strike a TST (due to reloading, weather, limited range capability, etc.), procedures must allow for rapid handover to another component for mission execution. Determination of "best capable" TST asset (such as fixed wing, ATACMS, TLAM, etc.) begins during the weaponeering assessment phase and continues through the force application phase.*[34]

The rapid part of the process is the ability to get real time actionable targeting intelligence to the shooter. The wide range of weapon systems in OAF's joint operational area included fixed wing fighter/attack aircraft, Joint Stand-Off Weapon (JSOW), Joint Direct Attack Munitions, attack helicopters, the Army Tactical Missile System (ATACMS), multiple launch rocket system (MLRS), conventional artillery, conventional air launched cruise missiles (CALCMs), Navy Tomahawk Land Attack Missiles (TLAMs), and naval surface fire support (NSFS). Procedures needed to be in

place that allowed maximum flexibility in the attack of mobile targets after considering all weapon system options.

OAF employed the highest proportion of precision weaponry used in an air operation. Precision weaponry reduced collateral damage and limited the exposure of aircraft to Yugoslav air defenses. NATO's combined precision capability allowed the alliance to limit instances of collateral damage to approximately 20 out of 23,000 bombs and missiles dropped.[35]

> We have invested in our Precision Guided Munitions (PGM) capability steadily over the years, and the payoff came in the ability to precisely strike more targets, in worse weather, and with less collateral damage than in previous air campaigns. ... Out of more than 9,400 designated target aim points, over 70 percent were struck by precision munitions.[36]

Strike aircraft with precision strike weapons attacked individual tanks on the ground with laser-guided weaponry. Although these numbers do not delineate how many of these aim points were mobile targets, initial studies report that measurable effectiveness was achieved against the mobile threat. The U.S. Navy's carrier airwing achieved 11% combat effectiveness during the first 10 days of KEZ ops and the during the last 27 KEZ ops days achieved 48% effectiveness.[37]

To overcome the weather challenges, Global Positioning System (GPS) guided Precision Guided Munitions (PGMs) were used. With the weather creating unfavorable conditions, pilots often flew through heavy overcast and clouds, hampering their ability to see the targets. The B-2 equipped with JDAM was the only manned aircraft that could strike targets with precision in all weather. "Furthermore, the B-2 and JDAM demonstrated flexibility when innovative procedures retargeted them in flight. This innovation proved crucial when addressing target changes during a 17-hour en route time."[38] Navy ships and submarines equipped with TLAMs hit targets less than two hours after target location and identification due to innovation in TLAM targeting techniques and procedures.[39] Those innovations included the establishment of specific time standards, generating theater online target folders, and coordinated TLAM/CALCM planning and execution at the Fleet Commander level, streamlining the planning and execution of TLAM strikes.[40] Eighty five percent of the mobile targets attacked by

TLAM were damaged or destroyed, demonstrating this weapon's utility and effectiveness.[41] Precision munitions enabled NATO airpower to set the standard for minimizing collateral damage for the future, but not every NATO member possessed a precision capability. Those countries lacking precision weapons were not able to attack targets obscured by weather or affected by collateral damage concerns.

Future

> *But clearly, one of the lessons we take away from this conflict, ...is the complexity of the air to ground mission, the interdiction mission, the things that we saw with mobile targets, with hidden targets, with camouflaged targets and decoys. The many systems that General Clark was able to combine effectively work against those threats in Kosovo in my view are going to demand more training opportunities of a synergistic nature, of an integrative nature to ensure that we can successfully employ the weapons systems, not fewer, and that technology is going to require that we bring all those assets to bear across service lines as well as within the service training.*[42]

The proliferation of weapons of mass destruction and the development of newer high-altitude, long-range SAMs represent today's potential mobile threat.[43] "Because of the continual advancement and proliferation of theater missiles (TMs), the threat cannot currently be countered by any single technical solution, nor will it likely be in the future."[44] Rather, the objective will be to ***prevent*** the launch of newer SAMs and TMs by **attacking** each element of the overall system, including such actions as destroying launch platforms, C2 nodes, and missile storage and infrastructure. This threat can be countered and the objective can be achieved by applying the synergistic "rapid targeting triad." *Attack operations* against mobile threats involve *"shooting the archer"* to defeat adversary missiles *before* they are employed.[45] Advances in technology coupled with application of OAF lessons learned will assist to counter the future threat.

Defense Advanced Research Project Agency (DARPA) continues technological advancement and investment in advanced sensor and information technologies including research in surveillance, identification and tracking: sensors to develop foliage-penetrating radar technology, modalities to defeat camouflage and concealment, all-weather radar capabilities, Automatic Target Recognition (ATR) and Automatic Target Acquisition (ATA) program developments.[46] These technological advances are attempting to reduce the sensor-to-shooter link timelines by removing the "man-in-the-

loop". Development continues with other technologies removing a "man-in-the-loop" (a person in the cockpit) with further testing and development of "the next generation" of unmanned aircraft - Global Hawk and AirBorne Laser (ABL). Key National Reconnaissance Office (NRO) initiatives in advanced space technology against the mobile threat include Space Based InfraRed System (SBIRS), Discoverer II, and "... spaced-based Ground Moving Target Indicator (GMTI) and Synthetic Aperture (SAR) imaging system ...providing near-continuous global surveillance, reconnaissance, and precision mapping directly to the theater or joint task force commander."[47]

Technology alone will not mitigate the TM threat. The key to success of the sensor-to-shooter link in the "rapid targeting triad" is a synchronized battlespace management cell with

> a sophisticated, interconnected, and interoperable grid of netted intelligence, surveillance, reconnaissance, computers, communications systems, and data analysis to deliver in real time, actionable intelligence to the shooter. This network must provide total situational awareness and nodal analysis that enables U.S. forces to act inside the adversary's decision loop.[48]

A future synergistic Joint Flexible Targeting Cell (JFTC) will synchronize the "rapid targeting triad" elements for attack operations against the mobile threat. New technologies will facilitate the JFTC's role as the JFC's "eyes and ears" of the battlespace.

The Joint Flexible Targeting Cell will strive to shorten intelligence exploitation/analysis time between sensor collection of target and weapon on target. One of the cell's primary objectives will be improved immediate fusion of real-time data (such as video feeds) with time late data (HUMINT, SIGINT, overhead imagery) to determine good targets and strike fleeting targets in a restrictive ROE environment. Once raw data is obtained, there needs to be rapid fusion of all relevant data and parallel dissemination of target intelligence from producer to strike units.

> Rapidly and accurately reporting on Bomb Hit, Bomb Damage, and Combat Assessment Sensor tasking against mobile targets must be responsive and incorporate seamless national and theater database access, near-real-time order of battle (enemy and friendly) with accurate moving target tracking for exploitation, and improved capabilities for processing and disseminating information.[49]

Real-time execution of an **integrated collection and force application plan** requires a level of joint and coalition synchronization and integration as demonstrated during KEZ ops. Timely execution of the joint targeting process requires pre-established, streamlined C2 arrangements tailored to expedite the flow of targeting information and execution decisions. Timely execution of attacks against immediate critical mobile targets requires the JFC to establish, in *advance*, procedures for components to effectively carry out attacks. Centralized prosecution planning should be conducted at the Joint/Combined Forces Air Component Commander (JFACC/CFACC) (or at the JFC's discretion). This centralized planning and control will allow adaptable airspace coordination and deconfliction which will contribute to timely and flexible force application of available resources.

To operate on a reduced decision cycle, the JFC must be organized to conduct knowledge-based operations. Information barriers that break down the planning, collection and execution processes must be eliminated, both functionally and technically.[50] JFTC organizational components will include operations and intelligence personnel in the following functional areas: collection management, information operations, current intelligence, multi-spectral interpretation to conduct imagery analysis, tactical reconnaissance to task ISR platforms, SIGINT to task electronic warfare assets, National Collection Management to task national assets, ISR-specific platform or assets unit personnel to provide system expertise, LNO's (Space, SOF, services, national agencies), communications and computers, and weaponeering experts. The incorporation of coalition assets (or personnel) must also be considered. National and theater commands need to have a cadre of trained JFTC personnel that in the event of a crisis can be rapidly deployed or can remotely provide support to a JTF. The JFTC must be established early on in the conflict and provide clear delineation of responsibilities for planning and execution for attacking mobile targets.

Some concerns of creating a JFTC based on the "rapid targeting triad" include manning and resource issues, potential adversarial asymmetric attacks on sensors and C2 systems, micro-management by commanders, over-reliance on PGMs, and growing disparity in technology with allies and coalition partners. To dispel the manning and

resource issue, the JFTC establishment must be sourced out of existing infrastructure - a trained and smart "rapid targeting triad" fly-away team, promoting organizational adaptability. The recent establishment of the Joint Task Force - Computer Network Defense (JTF-CND) addresses the concern of potential adversarial asymmetric attacks on sensors and C2 systems.[51] JTF-CND reflects a mission of increased emphasis on cyber defense against this asymmetrical threat. Micro-management by commanders is a concern counter to the concept of shared battlespace awareness, which emphasizes centralized control and decentralized execution. Although PGMs have become a weapon of choice for political and military leaders as demonstrated during OAF, PGMs are not a panacea. Operational commander's estimate of the situation and operational plans must continue to consider the full range of military options. The disparity in technology with allies and coalition partners is a valid concern as demonstrated in OAF. Training and exercising with allies and coalition partners needs to emphasize interoperability and standardization, specifically in communications.

USJFCOM concepts division's (J92) White Paper for "Attack Operations Against Critical Mobile Targets" (AOACMT) provides a roadmap for future research, training, joint experimentation, Doctrine/Organization/Training/Material/Leadership/Personnel (DOTMLP) implications, and war gaming for a future Joint High-Value Targeting Cell (JHVTV).[52] Capturing operational lessons learned from OAF, leveraging technology, integrating current joint doctrine, and using the AOACMT roadmap will continue to refine organization, battlespace management, planning, doctrine, training, tactics and operational processes in attacking *potential future* mobile threats.

Conclusion

> *If there is an attitude more dangerous to assume that future wars will be just like the last one, it is that it will be so utterly different that we can afford to ignore the lessons of the last one.*[53]

Although an overall "quantifiable"/statistical measure of effectiveness is not yet available regarding attack of mobile threats during OAF, air power did produce a success. OAF's "rapid targeting triad" lessons learned can be improved and applied to the potential threat of theater ballistic missiles. "A Joint Force Commander can ill afford to

test the resolve of an adversary to employ a chemically armed TM in the face of overwhelming U.S. military technology and firepower."[54] When employing operational art, the JFC needs to ask what is the likely cost or risk to the joint force in performing that sequence of actions? Taking into account enemy order of battle, enemy courses of action, friendly order of battle and friendly courses of action, a "risk analysis" list of guidelines is provided on what the JFC *needs to consider to mitigate the risk* of attacking future mobile threats. The JFC must weigh both the *military and the political* risk of *all mobile threats*, and decide the appropriate level of force employment. This risk analysis integrates guidelines for the JFC across all mediums, throughout the full spectrum of the conflict, and at the operational levels where TMs and SAMs are employed. The desired outcome is an operational design that minimizes the time required while maximizing the effects to eliminate the threat.

RISK ANALYSIS Guidelines

- Severity of threat (high-explosive warhead or missile chemical or biological warhead dispersant)
- Reaction time (attack time window of vulnerability)
- Defense around the target (may preclude an attack by manned aircraft)
- Threat missile range
- Expected Attack direction
- Effects desired (destroy, damage, neutralize, etc)
- Location of population
- Considerations for geographic, time and distance factors
- Available assets (single service versus joint or combined) to attack with appropriate weapon (capabilities, limitations, effectiveness, responsiveness, range, accuracy)
- Availability of host-nation assets
- Location of units on the ground and ships at sea
- Space-based assets, capabilities, and availability
- Communications systems and connectivity requirements
- Neutral country overflight restrictions
- Public Relations / diplomatic implications
- POW's?
- ROE / international law
- Environment
- Who gives shoot orders
- Who can negate shoot orders
- BDA and re-attack plan
- CSAR plan (SAFE areas around the target)
- Collateral damage (unintended civilian casualty estimate, urban setting, school, hospital, cultural/historical/religious sites nearby)
- Fratricide potential (friendly troops may be in area)

NOTES

[1] Office of Naval Intelligence and U.S Coast Guard Intelligence Coordination Center, Threats and Challenges To Maritime Security 2020 (Washington, DC, 1999), II-31 and II-45

[2] Joint Chiefs of Staff, Doctrine for Joint Targeting, (Draft Joint Pub 3-60) (Washington D.C.: 31 July, 1997), 2.

[3] General John P. Jumper, USAF, "Statement," U.S. Congress, House, Committee on Armed Services, Hearings before the Subcommittee on Military Readiness, 106th Cong, 26 October 1999, 12.

[4] Ibid., 1.

[5] USJFCOM Concepts Division (J92), "A White Paper For: Attack Operations Against Critical Mobile Targets," 09 November 1999, vi.

[6] Ibid., 1-1.

[7] Joint Chiefs of Staff, Doctrine for Joint Targeting, (Draft Joint Pub 3-60) (Washington D.C.: 31 July, 1997), 1.

[8] CDR Garry R. Mace, USN, "Dynamic Targeting and the Mobile Missile Threat," (Unpublished Research Paper, U.S. Naval War College, Newport, RI: 1999), 3.

[9] General Wesley Clark, USA, "Statement," U.S. Congress, Senate, Committee on Armed Services, Lessons Learned from Military and Relief Efforts in Kosovo, Hearings before the Committee on Armed Services, 21 October 1999, 18.

[10] General Wesley K. Clark, USA, "When Force Is Necessary: NATO's Military Response to the Kosovo Crisis," NATO Review, Summer 1999, 15-16.

[11] RADM W. Winston Copeland, USN, "Standing the Watch," Lecture, U.S. Naval War College, Newport, RI: 18 January 2000. RADM W. Winston Copeland, former Commander Carrier Group Eight, was embarked in USS Theodore Roosevelt, operating in support of Operation Allied Force / JTF Noble Anvil (March – June 1999).

[12] Clark, NATO Review, 16.

[13] Jumper, 4.

[14] Numerous reports. Jumper, 5 and RADM W. Winston Copeland, USN, "Standing the Watch," Lecture, U.S. Naval War College, Newport, RI: 18 January 2000.

[15] Jumper, 4.

[16] Ibid, 4.

[17] Joint Chiefs of Staff, Joint Doctrine for Intelligence Support to Operations, (Joint Pub 2-0) (Washington D.C.: 05 May 1995), x.

[18] Joint Chiefs of Staff, Doctrine for Joint Targeting, (Draft Joint Pub 3-60) (Washington D.C.: 31 July, 1997), 4.

[19] Information based on author's experience (stationed with Commander Carrier Group Eight, embarked in USS Theodore Roosevelt, operating in support of Operation Allied Force / JTF Noble Anvil (March – June

1999). During Kosovo Engagement Zone operations (KEZ ops), there was coordination amongst flexible targeting cells.

[20] General Wesley Clark, USA, "Statement," U.S. Congress, Senate, Committee on Armed Services, Lessons Learned from Military and Relief Efforts in Kosovo, Prepared Statement before the Committee on Armed Services, 21 October 1999, 3.

[21] Major William G. Chapman, USAF, "Organizational Concepts for the Sensor-to-Shooter World ... The Impact of Real-Time Information on Airpower Targeting," (Air University Press, School of Advanced Airpower Studies, Maxwell Air Force Base, AL: 1997), 17.

[22] Lieutenant General Marvin R. Esmond, "Statement," U.S. Congress, House, Committee on Armed Services, Hearings before the Military Procurement Subcommittee, 106th Cong, 19 October 1999, 5.

[23] Jumper, 5.

[24] Ibid.

[25] Information based on author's experience. Precision Guided Munition's (PGM's) (bomb-on-coordinate weapons) that were Global Positioning System (GPS)-aided required precise target coordinate mensuration (3 dimension) data with the challenge of the target re-locating every 4-12 hours. Mission planning was conducted in parallel: continue to refine tactics and procedures to target GPS versus mobile target sets. Combined target mensuration and mission planning is also significant advantage).

[26] RADM W. Winston Copeland, USN, "Standing the Watch," Lecture, U.S. Naval War College, Newport, RI: 18 January 2000. RADM W. Winston Copeland, former Commander Carrier Group Eight, was embarked in USS Theodore Roosevelt, operating in support of Operation Allied Force / JTF Noble Anvil (March – June 1999).

[27] LCDR(sel) Tracy Vincent, USN, tvincent68@hotmail.com, RFI, 22 January 1999. LCDR Vincent, Carrier Air Wing Eight targeteer, was embarked in USS Theodore Roosevelt, operating in support of Operation Allied Force / JTF Noble Anvil (March – June 1999).

[28] General Richard Myers, USAF, "For the Record," The Washington Post, 06 January 2000, 18.

[29] Esmond, 6.

[30] Lieutenant General Short, USAF, "Statement," U.S. Congress, Senate, Committee on Armed Services, Lessons Learned from Military and Relief Efforts in Kosovo, Hearings before the Committee on Armed Services, 21 October 1999, 15.

[31] Jumper, 5.

[32] Lieutenant Colonel Frank J. Caravella, "Achieving Sensor-to-Shooter Synergy," Military Review, July/August 1998, 1.

[33] Esmond, 4.

[34] Joint Chiefs of Staff, Doctrine for Joint Targeting, (Draft Joint Pub 3-60) (Washington D.C.: 31 July, 1997), 6.

[35] Jumper, 6.

[36] Ibid, 5.

[37] RADM W. Winston Copeland, USN, "Standing the Watch," Lecture, U.S. Naval War College, Newport, RI: 18 January 2000. RADM W. Winston Copeland, former Commander Carrier Group Eight, was embarked in USS Theodore Roosevelt, operating in support of Operation Allied Force / JTF Noble Anvil (March – June 1999). Increased effectiveness was due to TARPS utilization, target area familiarization, improved Forward Air Controller (Airborne) tactics, E-2 coordination, F-14 and FA-18 cooperative delivery tactics (buddy lasing), and improved weather.

[38] Jumper, 6.

[39] LCDR Mark Johnson, "Lessons From Kosovo," SPI News and Notes, October 1999, 3.

[40] Ibid., 3-4.

[41] Vice Admiral Daniel J. Murphy, Jr., USN, "Statement," U.S. Congress, House, Committee on Armed Services, Hearings before the Subcommittee on Military Readiness, 106th Cong, 26 October 1999, 1.

[42] Admiral James O. Ellis, USN, "Statement," U.S. Congress, Senate, Committee on Armed Services, Lessons Learned from Military and Relief Efforts in Kosovo, Hearings before the Committee on Armed Services, 21 October 1999, 14.

[43] Piotr Butowski, "Russia's First S-400 Squad to Deploy By Next Year," Jane's Defence Weekely, 26 January 2000, 1.

[44] Joint Chiefs of Staff, Doctrine for Joint Theater Missile Defense, (Joint Pub 3-01.5) (Washington D.C.: 22 February 1996), I-3.

[45] USJFCOM Concepts Division (J92), "A White Paper For: Attack Operations Against Critical Mobile Targets," 09 November 1999, vi.

[46] Dr. Thomas M. Strat, "Sensor Exploitation Challenges," 08 June 1999, <http://www.darpa.mil/darpatech99/Presentations/Scripts/SPO/STRAT.WE.txt> (09 January 2000).

[47] Keith Hall, "Statement," U.S. Congress, Senate, Committee on Armed Services, Space Policy, Programs, and Operations, Hearings before the Subcommittee on Strategic United States, 22 March 1999, 10.

[48] Admiral Bud Edney, USN (Ret), "Thoughts on Rapid Dominance," Shock and Awe, Achieving Rapid Dominance, December 1996, 3.

[49] USJFCOM Concepts Division (J92), "A White Paper For: Attack Operations Against Critical Mobile Targets," 09 November 1999, vi.

[50] Caravalla, 1.

[51] "Joint Task Force To Direct Pentagon's Cyber Defense," C4I News, 28 January 1999, 1.

[52] USJFCOM Concepts Division (J92), "A White Paper For: Attack Operations Against Critical Mobile Targets," 09 November 1999, 3-1.

[53] Joint Chiefs of Staff, Doctrine for Joint Theater Missile Defense, (Joint Pub 3-01.5) (Washington D.C.: 22 February 1996), II-7.

[54] Mace, 14.

Bibliography

Butowski, Piotr, "Russia's First S-400 Squad to Deploy By Next Year," Jane's Defence Weekely, 26 January 2000, 1.

Caneva, Joseph W., "Network-Centric Warfare: Implications for Applying The Principles of War," (Unpublished Research Paper, U.S. Naval War College, Newport, RI: 1999).

Caravella, Frank J., "Achieving Sensor-to-Shooter Synergy," Military Review, July/August 1998, 1-7.

Cebrowski, Arthur K., "Network Centric Warfare—An Emerging Military Response to the Information Age." Presentation. 1999 Command and Control Research and Technology Symposium: 29 June 1999.

Chapman, William G. Chapman, USAF, "Organizational Concepts for the Sensor-to-Shooter World ... The Impact of Real-Time Information on Airpower Targeting," (Air University Press, School of Advanced Airpower Studies, Maxwell Air Force Base, AL: 1997).

Clark, Wesley K., "When Force Is Necessary: NATO's Military Response to the Kosovo Crisis," NATO Review, Summer 1999, 14-18.

Copeland, W. Winston, "Standing the Watch," Lecture, U.S. Naval War College, Newport, RI: 18 January 2000.

Edney, Bud, "Thoughts on Rapid Dominance," Shock and Awe, Achieving Rapid Dominance, December 1996, 3 – 9.

Johnson, Mark, "Lessons From Kosovo," SPI News and Notes, October 1999, 3-5.

"Joint Task Force To Direct Pentagon's Cyber Defense," C4I News, 28 January 1999, 1.

Mace, Garry R., "Dynamic Targeting and the Mobile Missile Threat," (Unpublished Research Paper, U.S. Naval War College, Newport, RI: 1999).

Myers, Richard, "For the Record," The Washington Post, 06 January 2000, 18.

Office of Naval Intelligence and U.S Coast Guard Intelligence Coordination Center. Threats and Challenges To Maritime Security 2020 (Washington, DC), 1999.

Spratto, Timothy B., "Precision Guided Munitions And the Asymmetric Threat," (Unpublished Research Paper, U.S. Naval War College, Newport, RI: 1999).

Strat, Thomas M., "Sensor Exploitation Challenges," 08 June 1999, <http://www.darpa.mil/darpatech99/Presentations/Scripts/SPO/STRAT.WE.txt> (09 January 2000).

U.S. Congress, House, Committee on Armed Services, Hearings before the Subcommittee on Military Readiness, 106th Cong, 26 October 1999.

U.S. Congress, House, Committee on Armed Services, Hearings before the Military Procurement Subcommittee, 106th Cong, 19 October 1999

U.S. Congress, Senate, Committee on Armed Services, Lessons Learned from Military and Relief Efforts in Kosovo, Hearings before the Committee on Armed Services, 21 October 1999.

U.S. Congress, Senate, Committee on Armed Services, Space Policy, Programs, and Operations, Hearings before the Subcommittee on Strategic United States, 22 March 1999, 10.

USJFCOM Concepts Division (J92), "A White Paper For: Attack Operations Against Critical Mobile Targets," 09 November 1999.

U.S. Joint Chiefs of Staff, Joint Doctrine for Intelligence Support to Operations, (Joint Pub 2-0), Washington D.C.: 05 May 1995.

_____, Joint Doctrine for Operations, (Joint Pub 3-0), Washington D.C.: 01 February 1995.

_____, Doctrine for Joint Targeting, (Draft Joint Pub 3-60), Washington D.C.: 31 July, 1997.

_____, Doctrine for Joint Theater Missile Defense, (Joint Pub 3-01.5), Washington D.C.: 22 February 1996.

Vincent, Tracy <tvincent68@hotmail.com> RFI, 22 January 1999. Personal e-mail. (22 January 1999). U.S. Joint Chiefs of Staff, Doctrine for Joint Theater Missile Defense, (Joint Pub 3-01.5), Washington D.C.: 22 February 1996.